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OXC-0750

Copy 5 of 5

26 July 1960

MEMORANDUM FOR : The Record

SUBJECT : Nonstandard Day Effects, JT11D-20A Engine

1. The purpose of this report is to indicate the general magnitude of nonstandard day effects on uninstalled engine net thrust ( $F_n$ ) and uninstalled thrust specific fuel consumption (TSFC) for the JT11D-20A (M3.2) engine.

It is not the intent of this report to define the level of installed thrust or specific fuel consumption for the standard or nonstandard day conditions nor is it intended to imply that the standard, cold, or hot day conditions are fully representative of the expected mission environmental conditions. The installed thrust and TSFC by virtue of their dependence upon airframe considerations must be generated by Lockheed. Further environmental weather data must be secured in order to realistically estimate where within the envelope defined by the hot and cold days the mission environment will fall.

2. Attachment 1 presents certain uninstalled thrust and TSFC values for various day conditions (transmitted to Lockheed in June) and the % change involved in operating at the hot or cold day relative to the standard day.

(a) Attachment 1 is summarized as follows:

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USAF review(s) completed.

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<u>Flight Regime</u>	<u>Standard Day</u> (lbs./hr.)(lbs.)		<u>% Change Std. to Cold Day</u>		<u>% Change Std. to Hot Day</u>	
	<u>TSFC</u>	<u>F<sub>n</sub></u>	<u>TSFC</u>	<u>F<sub>n</sub></u>	<u>TSFC</u>	<u>F<sub>n</sub></u>
Takeoff	2.03	32500	+2.96	+11.7	+6.40	-10.5
Cruise @ 85000 ft.	2.17	9170	-5.99	+37.0	+5.99	-35.6
@ 90000 ft.	2.21	6920	-7.24	+42.8	+4.98	-23.9
@ 95000 ft.	2.26	5290	-7.53	+48.4	+3.80	-21.5

(b) In order that no misunderstandings be expressed by the data presented in Attachment 1, clarification of the terms engine net thrust ( $F_n$ ), TSFC, and "uninstalled" follows. Engine net thrust and TSFC define engine capability under given Mach number and altitude conditions and are not definitive of airplane capability. For instance, the top line (Attachment 1), for the cruise flight regime at 90,000 ft. altitude standard day should be read thus: "This engine when subjected to M3.2 @ 90,000 ft. altitude under standard day conditions will produce 9,880 lbs. net thrust with 2.07 lbs. fuel/hr. per lb. thrust specific fuel consumption for the 100% power setting." A completely erroneous interpretation would be: "The airplane is capable of M3.2 @ 90,000 ft. altitude under standard day conditions with this engine which produces 9,880 lbs. net thrust with 2.07 lbs./hr. lb. TSFC." The prefix "uninstalled" indicates that the data has not been corrected for inlet and ejector performance, airframe compressor air bleed, or airframe accessory drive power extraction.

(c) A slight improvement will be noted in standard day performance by comparing columns four and five. Column five represents the latest available data presented in a P & W memo dated 15 June 1960. The improvement results from a decrease in secondary air flow from 10% to 4% of primary airflow which was reassigned as primary airflow.

3. Several generalizations may be drawn from the somewhat limited available weather data covering the northern latitudes.

(a) The MIL-E-5007A Cold Day and the MIL-S-210A Hot Day describe a reasonable envelope of the measured temperature extremes.

(b) Midsummer temperatures measured approach the MIL-S-210A Hot Day within 2.5F°.

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(c) Midwinter temperatures measured do not approach closer than to within 10 to 15F° of the MIL-E-5007A Cold Day.

(d) Winter temperature may vary 88F° between Cold Bay and Thule at a constant 102,000 ft. pressure altitude.

(e) The yearly average of measured temperatures falls to the cold side of the A.R.D.C. Standard Day.

(f) Of definite interest and not included in the data available so far are such items as the local rates of change in pressure and temperature with respect to time or distance at the mission tapeline altitudes and enough plots of temperature vs geography at mission altitudes for various seasons so that a pattern or distribution of measured temperatures about the A.R.D.C. standard day may evolve.

SIGNED

Development Branch  
DPD-DD/P

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Attachment:

Nonstandard Day Effects on Uninstalled Engine Performance

DEV BR/DPD, [REDACTED]

26 July 1960

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